EXPERT REVIEWS

Recommendations for the management of food allergies in a preschool/ childcare setting and prevention of anaphylaxis

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Food allergy and anaphylaxis occur most commonly in children under five, the majority of whom attend preschool and early childcare. Children under five differ significantly from school-aged children, as do their care environments, yet specific strategies for managing food allergies in early childcare settings are generally lacking in existing guidelines and legislation. In this review, we outline the scope of the problem, the unique challenges encountered in the preschool environment and existing policy and legislation in Australia, the US, Canada and the UK. We outline the management guidelines and resources available from specialist societies, and the evidence base for specific management strategies including voluntary versus legislative approaches, staff training and education, banning of foods, and availability of multiple and generic adrenaline auto-injectors. We call for greater uniformity and consistency of policy in regards to the recognition and management of infants and children with food allergy in the preschool environment and specific programmes and policies tailored to this environment.

KEYWORDS: action plan • adrenaline auto-injector • anaphylaxis • food allergy • preschool • risk reduction

Incidence of food allergy in the preschool population: how big is the problem?

Food allergy is rising in prevalence and over the past two decades is estimated to have increased between twofold and threefold in countries such as Australia, the USA and the UK [1]. Due to the natural history of IgE-mediated food allergy, the majority of food-allergic reactions occur in preschool-aged children, whom we define as children under the age of 5 years for the purpose of this review. Estimates of IgE-mediated food allergy in countries such as Australia suggest a prevalence as high as 10% in infants aged 12–18 months [2]. Although the majority of food-allergic reactions in preschool children do not result in anaphylaxis, the total episodes of food-related anaphylaxis are greatest in this group and, according to an Australian study of hospital admissions for anaphylaxis, also rising at the fastest rate, with a 5.5-fold increase over 10 years to 2005 [3]. Fortunately, deaths from food-related anaphylaxis in this age group are relatively rare.

Accurate data for the incidence of food-related anaphylaxis are difficult to collect, and estimates of anaphylaxis are based largely on reports of presentations to emergency departments or parental report. Both methods are subject to reporting bias and may over- and under-report the true rate of food anaphylaxis. A Swedish study of children presenting to the emergency department with allergic reactions reported that 50% of reactions occurred in children less than 3 years, with the vast majority triggered by food (rather than a drug or insect sting). Although the proportion of older children (>4 years) presenting with anaphylaxis was higher, because allergic reactions were more common in children under the age of 3 years, most episodes of anaphylaxis occurred in this age group [4]. A similar study from Australia reported a median age of 2.4 years for food-related anaphylaxis presentations to

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an emergency department over a 5-year period, with 72% of presentations in children aged under 5 years [5]. The prevalence of parent-reported, food-induced anaphylaxis in Australian children was estimated to be 1 in 170 in preschool children compared with 1 in 1900 in school-aged children [6].

Incidence of food-allergic reactions in the preschool childcare setting

The proportion of infants and children who attend preschool/daycare varies significantly between regions and countries. In the USA, it is estimated that approximately 60% of infants and children receive care outside the home, with 25% of all preschool aged children spending the majority of time in a childcare/preschool setting and a further 13% in family daycare not provided by a relative [7]. In the UK, in 2011, there were 92,200 childcare and 15,700 early years providers (reception and nursery classes), with estimates that over 70% of children aged 2–4 years attended formal preschool, nursery school or daycare [8]. In Australia in 2011, 50% of children aged 0–2 and 70% of children aged 3–5 received care outside the home on a regular basis. Formal childcare (including preschool) was used by 30% of children aged 0–2 and 60% of children aged 3–5 [9]. Thus, a considerable proportion of children under 5 years spend time in the preschool setting.

The frequency of allergic reactions to foods including anaphylaxis in the preschool/early childcare setting is unknown. US-based studies report that 16–18% of children with food allergies have had a reaction from accidentally eating food allergens while at school [10,11]. In a random phone survey of children with a diagnosis of peanut or tree nut allergy, 64% of accidental exposures resulting in allergic reactions occurred in the childcare setting [11]. A recent US-based observational study (which recorded parent-reported accidental food-allergic reactions in a group of preschool children with very high likelihood of food allergy) found the majority of adverse reactions occurred when the children were in the care of the parents, and not at childcare; however, the design of the survey may have skewed these results away from reports in the childcare setting [12]. Among respondents of an earlier Internet-based study in the USA, who were invited to provide information on their most severe reaction, 24% of the reactions described in children occurred at school or daycare [13].

Fatalities in the preschool/school setting from food-related anaphylaxis are rare and are typically associated with a delay in administration of adrenaline [14,15]. Of 34 food-triggered fatal allergy reactions in UK children between 1992 and 2007, one occurred in a preschool environment and five in the school setting [16]. Fatalities have been in the main associated with allergy to peanut, tree nuts and dairy products [14,16]. This highlights the essential role of a cohesive plan of management for children at risk of food allergy in any school or preschool environment.

Why is preschool different from the school setting with respect to management of food allergies?

The preschool setting has unique challenges related to management of infants and young children with food allergy. Even the older child (aged 4+) in preschool cannot be assumed to understand implications of their food allergy(s). Infants and children in childcare are dependent upon their teachers/carers for most activities of daily living, including feeding and hand washing. Language acquisition over the early years means that small infants may not be able to verbalize or describe subjective symptoms of food allergy (such as mouth tingling, throat or chest tightness, nausea and abdominal pain) and food refusal can be difficult to distinguish from an early allergic reaction.

Infants and toddlers are messy eaters who do not understand no-sharing rules concerning food and may grab bottles or food from other children. They frequently mouth toys, which can leave residual allergen on the surface of toys and equipment, ready to be handled (and mouthed) by another infant. Activities using food-based materials (play dough, dried pasta) are common in the preschool setting and may pose a risk to the allergic child. Although the risk of serious allergic reaction or anaphylaxis from casual contact with an allergen is low or negligible [17,18], young children will often ingest craft materials or suck their fingers while playing with such food-based materials.

Preschool environments are also generally more likely than schools to prepare and provide lunch and snacks, although this varies with country and region. In the USA, food programs (such as the *Child and Adult Care Food Program*) provide meals for preschool children from low-income families [19]. Moreover, most young infants have a dietary dependence on cow milk/soy-based products, making risk reduction strategies for dairy- and soy-allergic infants especially problematic in the under 2s age group. Early childcare settings are also more heterogeneous than schools, running the gamut from small family daycare providers, to large daycare centers and preschools with purpose-built kitchens, classrooms and play areas, and policy must therefore take this into consideration. Staff education in the preschool setting may also be harder to implement and maintain as, in many regions, early childcare/preschools have higher staff turner over, with generally lower rates of pay and less requirement for formal qualifications than school staff. With such high staff mobility, it is important to have standardized 'action plans', policies and procedures across regions to reduce the risk of mistakes and improve the effectiveness of refresher and retraining in the recognition and management of anaphylaxis.

Strategies specific to the preschool setting for reducing risk of allergic reactions have been suggested. These include organizing table space for safe feeding with avoidance of liquid contamination; labeling individual cups and bottles with children's names; limiting the use of dummies/pacifiers; and attention to thorough routine surface cleaning (including toys, equipment and furniture) [20,21]. Such strategies appear sensible and self-evident; however, there is no current evidence of their effectiveness, although studies of such interventions are underway [21].

Policy & legislation for food allergy in childcare settings

The USA, Canada and Australia all have to a greater or lesser extent national or state-based policy and/or legislation in an

attempt to protect children at risk of life-threatening allergies while at school. The situation in childcare centers and the preschool environment is generally less clear.

In 2013, the US CDC released *Voluntary Guidelines for Managing Food Allergies in Schools and Early Care and Education Programs* [22] in response to Section 112 of the US FDA Food Safety Modernization Act of 2011 [23]. The document contains a section with recommended actions for putting the guidelines into practice specifically in the early childcare setting, for example, cleaning tables and chairs and enforcing hand washing for all children before and after eating. *Caring for our Children* is a set of voluntary national health and safety standards for early childcare and education compiled by the American Academy of Pediatrics and the American Public Health Association with government funding, which states may use to guide their legislation [24]. Legislation regulating schools and early childcare facilities in the USA is devolved to the 50 states, and to some extent, further still to local school districts. Many states do have comprehensive laws and policies for managing food allergies in schools (listed in [25]), but policies for the early childcare setting are more scarce [26]. For example, New York State has laws requiring local school boards to have in place food allergy management policies addressing certain elements, but these laws do not apply to early childcare providers [27].

In Canada, *Sabrina's law* covers all public schools in the Canadian province of Ontario and was enacted in 2006 following the death of a teenage girl in her first year of high school. It requires school boards to have an anaphylaxis and food allergy policy and that school principals develop individual healthcare plans for students deemed at risk of anaphylaxis [28].

The UK does not currently have any specific legislation or regulation governing management of children with food allergies within the school/early childcare environment. However, under Health and Safety legislation passed in 1974, school/nursery operators have a duty to ensure in 'so far as is reasonably practicable' the safety of any child in their care. The definition of 'reasonably practicable' is unclear, but includes (at one extreme) excluding an allergic child where the childcare facility is unable to provide a reasonable level of safety. The Children and Families Act was passed into UK law in March 2014 [29] and includes a section for both 'nursery' schools and schools that requires governing bodies to make arrangements for supporting pupils at school with medical conditions. Despite the legislation, only schools will have a statutory duty, from September 2014, to have a policy for supporting children with medical needs (including food allergies), mandating such children to have an Individualized Healthcare Plan [30]. However, detailed content as to specific management strategies is not provided. It is not clear why the preschool environment is not included in this duty as the existing statutory advice requires preschools to obtain information about any special dietary requirements (including food allergies) but not the need for an Individualized Healthcare Plan [31]. In practice, most early childcare environments have policies that are often informed by publications from the voluntary/patient support organizations. Of note, the government of Northern Ireland (a constituent country of the UK) does have published voluntary guidance [32], as do some local councils within the remainder of the UK.

Australia is one of the first countries to have legislation specially addressing anaphylaxis in the preschool/childcare setting. Since August 2013, the National Quality Framework requires all children's education and care services to have educators trained in first aid, asthma management and anaphylaxis to deal with medical emergencies [33].

Does legislation or national policy work?

A study comparing compliance with actions plans and anaphylaxis readiness in Canada found significantly greater compliance in those regions with legislative power compared with regions with voluntary guidelines only [28]. Although there is no direct evidence that compliance automatically translates to reduction in risk or decreased allergic reactions, it may be that preparedness to administer timely emergency treatment is more important than a change in allergic reaction rate or episodes of anaphylaxis occurring in an early childcare setting. *Both elements are important; however, given that the types of food allergies most prevalent in the preschool age groups, such as milk, soy, egg and wheat, are very difficult to remove from the preschool environment, it will always be the case, no matter how careful staff are and how much education and training is carried out that accidental ingestions will occur. In this context, we believe that the ability to effectively recognize and treat anaphylaxis is therefore crucial as it does not depend on 100% compliance with policies and procedures, which is unlikely to be achieved by any center over a sustained period of time.*

A 2010 survey of randomly selected Chicago daycare center directors found only half believed they were capable of effectively managing an allergic reaction [34]. It is not yet clear whether the new US CDC voluntary guidelines will improve the preparedness of schools and preschools to identify, recognize and manage food allergy and anaphylaxis.

Specialist society guidelines for management of infants & children at risk of anaphylaxis in a childcare setting

Many specialist Allergy and Immunology and Pediatric societies have guidelines and resources for risk reduction management in the school setting. Some also have specific guidelines for preschool, or cover aspects of preschool management in their general policies. Although there are some regionally specific recommendations, the foundation of all the guidelines is based on similar fundamental elements, which include:

- Recognition and identification of the child with food allergies*;
- Creation of an individualized healthcare plan to reduce risk for the individual child;
- Generic risk reduction measures (no food sharing policy);

*Identification of the child at risk of food allergies must minimize the risk of stigmatizing or physically or emotionally ostracizing the child [20].

Table 1. Helpful websites and web-based resources.

	Resources	Specialist society policies/position statements	Government recommendations/ policy	Ref.
USA	Managing food allergies at school	Caring for our children	Voluntary guidelines for managing food allergies in schools and early care and education programs	[22–24,26,48,55]
	School access to epinephrine map 2014		State licensing and regulation information 2014	
			Food Safety Modernization Act 2011	
Canada		Anaphylaxis in schools and other childcare settings 1995		[37]
UK	Help for schools	Allergy action plans for children 2013	Guidelines for management of anaphylaxis in educational establishments 2010	[32,39,49]
Australia	ASCIA anaphylaxis e-training for schools and childcare	ASCIA action plans 2013	National quality framework	[33,41,47]

ASCIA: Australasian Society for Clinical Immunology and Allergy.

- Education of school personnel in the recognition of allergic reactions and in the management of anaphylaxis, including training in adrenaline autoinjector administration;
- Education of food-allergic children, families and peers;
- Standardization of action plans, education and training materials across jurisdictions/regions or countries.

The American Academy of Pediatrics has a set of guidelines for managing allergies in schools [35] that specially does not include the preschool and daycare setting in its brief. The American Academy of Allergy, Asthma and Immunology has a 1998 position statement for management of anaphylaxis in schools and other childcare facilities, but this makes few specific recommendations specific to the preschool setting and has not been updated [36].

The Canadian Society for Allergy and Clinical Immunology has a consensus statement 'Anaphylaxis in Schools and Other Child Care Settings' outlining their recommendations [37], which include that allergic children at school and in childcare should only consume food that has been prepared at home and that in nursery, daycare settings and earlier public school grades all peanuts and peanut-containing foods be banned.

The European Society for Asthma, Allergy and Clinical Immunology in conjunction with the GALEN2 task force published recommendations for food allergy in schools [38]; however, these contain no specific recommendations for the preschool/childcare setting. The British Society for Allergy and Clinical Immunology has recently produced a standardized emergency care 'Action' plan for allergy [39]. There has been no research as yet as to its uptake for routine use in UK schools and preschools.

In Australia, the Australasian Society for Clinical Immunology and Allergy (ASCIA) has guidelines for the prevention of anaphylaxis in schools, preschools and childcare, which were updated in 2012 [40]. The guidelines stress the importance of identifying and obtaining information about food-allergic children, staff training in the recognition and management of allergic reactions including training in the use of adrenaline autoinjectors, implementation of practical risk management strategies and age-appropriate education of allergic children and their peers. The guidelines do not recommend blanket bans on food allergens, but support the use of limited restrictions within the preschool and early primary school setting. ASCIA has nationally standardized action plans for allergic individuals that are widely used across the preschool and school sector [41].

The 2012 World Allergy Organization Anaphylaxis Guidelines do not specially outline recommendations for school or preschool settings [42].

Useful websites resources, specialist society guidelines and government policy websites are summarized in Table 1.

Banning foods in preschool settings

Although most specialist societies and government policies/guidelines do not support blanket banning of allergenic foods in the school setting, the banning of allergic foods in the preschool environment is less clear. Many centers choose to be 'nut free' in the USA, the UK and Australia. Although nuts are very common allergens (and are overrepresented as the causal agent in the very small number of food allergy fatalities in this age group in the USA and Australia), most food allergies at this age are to dairy, egg, wheat and soy. It is impractical and often impossible to consider the ban of these basic foods in the preschool environment. Centers who supply meals to children will often request that parents of known food-allergic children provide their meals and snacks.

Removal of foods with precautionary allergen labeling (e.g., 'may contain traces of xxx') in the school setting is controversial, but generally not recommended in the USA and Australia. Within the UK, many primary (elementary) schools do exclude foods with precautionary allergen labeling to nuts, but official guidance is lacking. Some guidelines suggest that meals prepared at preschools or childcare services with precautionary allergen labeling not be given to children allergic to the food in question, but can be served to other children at the same center [40].

Training/education for staff

Key to an effective risk reduction strategy for children with food allergy in preschools is adequate training of staff in the recognition and management of allergic reactions. This includes training of staff in the use of different adrenaline autoinjector devices, as different devices are activated in different ways and this can cause considerable confusion to both healthcare professionals [43] and the general public.

Sicherer *et al.* reported a fall in annualized reaction rates following a structured educational program targeted at parents [44]; however, the decrease was based on historical rates, the study was not confined to preschool aged children and the training was for parents and not childcare staff, so applicability to staff education in the preschool setting is questionable. More generally, however, the study does support a role of education in reducing food-allergic reactions. Reinforcement of education has been shown to be important for retention of knowledge and especially for procedural skills such as resuscitation [45] and basic and advanced life support [46], which is likely to translate to administration of an adrenaline autoinjector. Such findings support the notion that education needs to be not a one-off experience but repeated at frequent intervals, with hands-on experience at using training devices. Most authorities recommend at least annual training [21]; however, very few countries or regions mandate the frequency of training or refresher courses. Annual anaphylaxis training will become mandatory in NSW (Australian) public schools in 2014/5; however, this will not apply to the vast majority of preschool and childcare centers within that region.

There are many educational resources for staff of preschool and childcare centers. Standardized resources and e-training modules for teachers and childcare staff are available through specialty societies and patient/parent advocate groups including ASCIA [47], Food Allergy Research and Education [48] and Anaphylaxis Campaign (UK) [49]. The current ASCIA resource is preschool/childcare specific, something that appears to be unique in this respect.

Provision of generic adrenaline autoinjectors

There is continuing debate regarding the value of generic (nonpatient prescribed) adrenaline autoinjectors in the school and preschool setting, whether infants and children identified at risk of food anaphylaxis should have one or two adrenaline autoinjectors available at the school/preschool and where and by whom these devices should be carried or stored.

The provision of generic adrenaline autoinjectors has merit, given the frequency with which adrenaline autoinjectors are incorrectly administered [50], resulting in inadequate or no dosage to the patient. Furthermore, up to 25% of food-related anaphylaxis in children is reported to occur in children who were undiagnosed with an allergy to the offending food [11,51]. Most children who require adrenaline for an allergic reaction only require a single dose [52]. Prolonged or biphasic reactions that may require further adrenaline doses likely account for between 2 and 19% of food-allergic reactions [53,54]. It would be significantly more cost-effective to support generic autoinjectors in the preschool and school setting than to require all children at risk of anaphylaxis to provide two autoinjectors.

The US's CDC guidelines advise that both schools and early childcare providers consider keeping multiple doses of adrenaline onsite to allow for ease of access, and in case a second dose is needed, in children already prescribed an adrenaline autoinjector. They advise stocking nonpatient-specific autoinjectors to allow for additional doses of adrenaline when needed. In the USA, 30 states have laws or guidelines in place allowing schools to stock undesignated adrenaline autoinjectors, and four states explicitly require it, which is summarized in map form by Food Allergy Research and Education [55]. In November 2013, the US federal government passed the School Access to Emergency Epinephrine Act, which provides financial incentives for states to have laws requiring schools to have a supply of adrenaline and permit trained school personnel to administer it to children without a prescription. Of note, this legislation is applicable only to schools, and not the early childcare environment.

Within the UK, current practice is for children to be prescribed autoinjector device(s) (often two or more) on a named-patient basis only; generic autoinjector devices are not currently permitted.

In Australia, several states have now mandated the provision of generic adrenaline autoinjectors in government (public) preschools, primary and high schools.

Expert commentary & five-year view

The prevalence of food allergy (and food-induced anaphylaxis) is greatest in children under age 5 years. The incidence of food-allergic reactions occurring at preschool is unknown, but given the high rates of food allergy and preschool attendance in this group, there is a genuine requirement for preschools to be equipped to manage food-allergic infants and children. The preschool environment poses unique challenges for managing food allergy and merits specific risk reduction measures in addition to policies and procedures that apply generically across both the preschool and school environment.

Most regions currently have no mandatory policies that deal with food allergy in the preschool setting and likewise few specialist societies have specific recommendations for preschools. Many current recommendations and policies relate specifically to the school aged child and the primary and secondary school environment. It is therefore highly desirable for future guidelines to specifically consider the preschool environment and

Table 2. Possible strategies for the management of food allergies in the preschool childcare environment.

Risk identified	Potential management strategies
Exposure to allergen – through meals/snacks	• No food sharing policy • Restrict nonessential foods containing allergen. e.g., nuts • Consider provision of food for children with food allergies by their families (and not the childcare center) • Organizing table space for safe feeding with avoidance of liquid contamination • Labeling individual cups, bottles, containers with children's names
Exposure to allergen – through sharing of dummies, toys, feeding bottles, etc.	• Limiting the use of dummies/pacifiers • Monitoring for ability of young children to grab other children's bottles, cups, etc. • Labeling individual cups/bottles with children's names • Routine cleaning (including toys, equipment and furniture)
Exposure to allergen – through play involving allergens, e.g., playdough	• Use allergen-free alternative • Offer alternative activity to children allergic to the foodstuff in question
Lack of individual staff members' awareness	• Regular training for all staff (annual/biannual) on reaction recognition and management • Identification of children with food allergies in a sensitive manner • Individualized allergy management plans with photos • Sharing of information between parents, healthcare professionals and preschool
Lack of systematic approach within institution	• Staff training including use of AAI • Documented policy for management of food allergies • Individualized allergy management plans with photos attached • Provision of generic AAI (where legislation allows)

AAI: Adrenaline autoinjector.
Data taken from [40].

likely that mandated policies will improve overall safety and preparedness to act in the event of serious food-allergy reactions in the preschool environment. These policies should, at a minimum, include the requirement for a management/action plan for all food-allergic infants and children at risk of anaphylaxis and regular staff training in the prevention, recognition and management of allergic reactions and anaphylaxis (Table 2). Evidence suggests that one-off training in procedural or clinical skills is insufficient, and on that basis we recommend that annual or biannual refresher training in recognition and management of anaphylaxis becomes at standard requirement for preschool staff.

It is highly desirable to have regionally standardized training and 'action plans' across all education environments. This is particularly so in the preschool setting as the preschool workforce is particularly mobile and staff are likely to move from center to center within short time frames. Therefore, standardization of practice and training across regions is likely to reduce confusion and errors.

Most specialist societies and government authorities do not support blanket bans on allergic foods in schools. The rational for this general approach includes not creating a false sense of security for the child, parent or staff and the risk of removing the emphasis on prevention and preparedness to act in the event of a serious allergic reaction. Although this appears sensible for the school-aged child, it is reasonable to consider removing common allergenic nonstaple foods (such as peanuts and tree nuts) from the preschool environment where understanding 'no food sharing' and concepts about food choices may not be well developed in the preschool child. In any case, many preschools voluntarily declare themselves 'peanut and tree nuts' free to reduce risk. Elimination of other common allergens is impractical, and risk minimization strategies are encouraged in preference to banning of foods.

Provision of generic autoinjectors in preschools appears a sensible strategy. It is likely to be significantly more cost-effective than requiring children at risk of anaphylaxis to provide more than one individually prescribed device. Moreover, it allows for treatment of children who have their first allergic reaction (and require adrenaline) at preschool.

The move to address the rights and needs of food-allergic children within the school environment, such as illustrated by the recent release of the US CDC voluntary guidelines, is welcome. However, we urge specialist societies and legislators to consider the preschool environment as unique and deserving of specific attention. We recommend that childcare/preschool-specific national guidelines and training be developed and implemented and are hopeful that the next 5 years will see a more concentrated effort to address the needs of food-allergic infants and children in the preschool setting.

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Key issues

- Food allergy and anaphylaxis is common in the preschool age group and many infants and children attend preschool.
- There are unique challenges in managing the risk of allergic reactions in infants and young children.
- There is a lack of attention to the preschool setting in most national and regional and specialist society guidelines and policy that deal with food allergy in schools.
- Training of staff in the prevention, recognition and management of food allergy in the preschool setting requires regional standardization and specific attention to preschool specific measures.
- Effective training for the prevention, recognition and management of food allergy requires regular re-exposure to education.
- Generic adrenaline autoinjectors are preferable to a requirement that individual food-allergic preschoolers provide multiple devices.

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